PETRALOGY, OR THE KNOWLEDGE OF ROCKS AND STONES.

BY HENRY G. MONTAGUE, ESQ., PROFESSOR OF NATURAL PHILOSOPHY.

(*Continued from p. 278.*)

The learned Bacon truly observes that "they who have presumed to dogmatize on nature, as on some well-investigated subject, either from self-conceit or arrogance, and in the professional style, have inflicted the greatest injury on philosophy and learning: for they have tended to stifle and interrupt inquiry exactly in proportion as they have prevailed in bringing others to their opinion; and their own activity has not counterbalanced the mischief they have occasioned by corrupting and destroying that of others." Never were words more truly applicable than to the plutonic geologists of the present day, who, having no facts of their own, presume to select those facts and opinions of others suited to their own theoretical absurdities, concealing or perverting the rest. The facts and opinions of such men as Saussure, De Luc, Werner, Van Boch, and numerous other observing mineralogists, are wholly lost sight of in the present day; baseless imaginings supersede facts the most important, and closet philosophers now seek rather to follow in the wake of discovery, than, by extensive travel and observation, to lead the way. The most recent works on geology and mineralogy are without exception so interwoven with extravagant speculations and theories, violating the natural operations of nature, that there is not one work fit to direct the minds of youth to the proper path of inquiry, and to prepare it for observation.

The writer of the letter in THE BUILDER of last week having skimmed the surface of one side of the question, adopts the opinions of others as his own, and were he to direct his steps abroad, the usual consequences would follow: Instead of reviewing rocks, stones, minerals, and earths, as a sensible mineralogist, and studying the several causes of effects manifest to the senses, we should hear from him, as we do from others, that the mountains of such a district are plutonic; that their bases consist of primary rocks; that such and such beds and formations were of volcanic origin, and in every piece of jasper, porphyry, granite, &c., in every circular hollow in a mountain, in a plain, or in a coral reef, he would fancy he beheld the workings of volcanoes. The merest tyro in geology may, now he has the igneous marks pointed out, sally forth in his Quixotic voyage of discovery, and, by a few generalizing touches, become the fashion and the favourite of the day; but what do we learn by these generalizing terms, or who but geologists would apply local phenomena to general, nay to universal explanations?

I am asked if I can account for the filling up of veins, and the appearance of dykes and faults? Most assuredly I can, without having recourse to hypothesis, no matter whether these veins be filled up with granite or any other material. But those departments belong more strictly to that part of mineralogy which embraces the metalline formations, and to understand them rightly requires much disquisition. To the question of the writer I will put another. Whence come the veins of steatite, or mineral tallow, so often found intersecting the granites of Cornwall? Again, whence come the veins, lodes, faults, cross-courses, dykes, and other curious phenomena, as faithfully depicted in one small piece of tinstone as in the most magnificent mineral bed? Are they, the one or the other, produced by some subterranean and internal power? Again, whence come the veins of nature, generally filled with quartz, and so common to granite and to all kinds of rock? Again, I ask, what is granite?

The material ejected from volcanoes is not generally melted masses of earth; it is more usually torrents of mud, or mud and water, ashes, fragments of rock, and other matters similating to known strata of that locality. When in the state of molten lava, it moves a dense ponderous body, slowly advancing, melting small impediments, but encircling the larger; it flows as a stream of water would through a valley, but it does not throw out diverging lines even in yielding masses, nor is it known to fill up veins and fractures to that delicate point noticed at Glen Tilt; nor is it known to penetrate beds in contact in this manner, nor would it do so even in the most yielding soil. Again, when it is seen discharging rivers of mud, sea-sand, sea-shells, and rocks, it must be borne in mind that these materials are like to the most recent formations, consisting sometimes of vegetable earths, sometimes of ocean marl and chalks, of sands common to the shores where the volcano is disposed, and of fragments of rocks common to observable strata. This, therefore, is but a displacement of matter, attended, of course, with new chemical and mechanical combinations, but still such as we know the origin of. The molten lava never forms as mountains, much less mountain-chains; it has never been known to elevate a mountain or an island, except piecemeal; for Humboldt's account of the rise of the Jurugo is purely fabulous. As it was ejected from the earliest records of man, so is much of it unaltered in the present day, and no two lavas are to be found alike. The appearance of the granite in Glen Tilt is that of a sedimentary deposit, filling-in rents and fissures, produced by various causes, in the limestone and clay-slate; and it is well known that clay, as it consolidates and imparts its moisture, separates into regular and irregular parts, and if much silica be therein, it exudes and fills up these divisions in the form of quartz, and the earths, after digestion in hot water, produced by volcanic or chemical action, on abstraction of their moisture, have a tendency to assume the basaltic form; for basalt is no more a volcanic product than is the muddy deposit of some rivers, which, treated as above, would, under like contingencies of climate and association, pass into the like result.

Granite is an ever-varied and perpetually-varying substance, and is equally varying in its form, disposition, and external character: although frequently found in continuous masses, or aggregated, it is very often stratified, and exhibiting in this stratified state two or more perpendicular fronts in common with limestone, and presenting the same perpendicular front along a whole chain of hills or mountains. All parts of Mont Blanc are thus composed of vast layers of granite, perpendicular to the horizon, and directed from south-east to north-east. The stratification is the same near Carlsbad and Tiplitz, in several parts of Bohemia, and also towards the Riesengebirge. La Perouse describes the granite of part of the Pyrenees as disposed in layers and beds; Cronstedt and others speak of it as existing in this state on the Kenne Kulle, in Sweden, and Belling, in West Gothland; Pallas followed vast and continuous layers of granite through whole tracks of mountains in Siberia, part of the Ural Mountains, in the neighbourhood of the lake Kolywan, having the appearance of huge artificial structures, in which the layers appear to be loosely piled on one another. Professor Playfair found stratified granite in England, at Chorley Forest, in Leicestershire, where, particularly near Mount Sorrel, beds of granite are seen holding the same direction with those of the subjacent "horn-stone schistus;" also at Fassnet Water, in Berwickshire, and Humboldt, Charpentier, Von Gersdorf, and others, testify to the stratified state.

Again, granite is found alternating with gneiss, as for instance, on the Schneekoppe, the highest point of the Reisengebirge. Again, granite is found in some parts of Northern India, resting on a common and extensive base of a bluish clay; in Finland, micaceous quartz and clay-slate form the base in common, with or upon granite; in Nubia, it rests upon an undisturbed calcareous basis, in the Egyptian desert on clay.

Again, it passes by gradual transition into other kinds of rock; thus, for instance, the greatest part of the north-east side of the chain which separates Selcea from the county of Glatz, between Wartha and Reichenstein, is covered with sienite, which passes into granite; in many parts of the world it passes into gneiss, hornblende rock, coarse sandstone, mica-slate, sicate, &c.

Granite occurs in continuous masses, forming the chief component part of many mountain-chains, the basis of some, the apex of others, and disseminated or intersecting other beds.

That granite is not the product of fusion, or ejected from the bowels of the earth, is demonstrated by the position, inclination, and dip of mountain-masses; by the unbroken continuity throughout parallel ranges and groups; by its exact conformity to the laws of formation governing matter in its distribution in the ocean even in the present day; by the impossibility of these continuous mountain-masses having been once in the state of melted lava, as demonstrated by vast mineral beds, bitumen, sulphur, steatite, and other products which they contain, and of which we have no analogy in lavas; by their crystalline structure, their granular composition, and in some varieties perfect mathematical disposition of their compounds, which could not have been thus exhibited in the cooling down of a melted body of earths; by their known progression from the plastic state to semi-crystallization, and finally to the highly indurated state, which latter is only acquired by long exposure to atmospheric air. By the numerous reasons which I have adduced to prove the origin of the various kinds of rock, their gradual transition into each other exhibiting a common origin and common properties, and finally by the proofs with which I am furnished that the volcano, however deeply seated, is always locally disposed, and at a comparatively small depth within the earth.

Granite, in common with other sedimentary deposits, intersects and is intersected, covers or is covered in with others; there are no laws of distribution other than those arising from tidal action, sedimentary deposition, organic aggregation, and the action of winds, of expanding gases, and fire. Look for a moment at the phenomena of the uncovered regions of the desert, the loose masses consolidate into here rocks, the rocks, by the expansion of atmospheric heat, open into vast fissures, and the sands, driven by the winds, cover in these rocks and fill in their fissures. Again, in hot and even warm regions, the thirsty soil, parched up with drought, opens into cracks and rents of incredible extent and depth, and when the rains fall abundantly, the waters, loaded with the lighter matters of the surface soil, rush into these fissures, which thus filled up, the lower beds become traversed with dikes and veins of material differing from their own in composition and character. Admitting that the fiery deluge, pouring over the rent and distorted earth, would fill up those rents in a similar manner, still the violence done to nature by these subterranean movements must be impressed upon every bed exposed to its influence.

To talk of mountain ranges being bodily lifted up without displacement, and to assume the exactitude of sedimentary deposition, or of the limestone ranges which are the architectural displays of living action and local disposition, is to talk foolishly; to talk of those masses so contradictory in their nature, and disposition of parts, and containing many combustible bodies within them, being spouted out of the interior of the globe by one or by a thousand channels, is as repugnant to human reason, as it is contrary to all our acquired experience. The beds of this earth are locally disposed upon or among each other; the coral formations assume directions within the waters, precisely similar to those limestone, chalk, and oolite ranges we find now composing so vast a portion of dry land; the valleys and troughs of the ocean are filled up with sand-banks taking the direction of the tides, with chalky deposits blending with shells and other marine exuvia, with vegetable earths, and clays carried into them by rivers and deposited in the line of action, and over local areas, the one deposit covering, the one deposit blending with the other. Again, the dry earth is subject to like changes; the deposit of one epoch, the hill and the mountain chain, becomes covered with or intersected by the sedimentary deposition of another epoch; the necessary, the inevitable result is numerous changes; some of these unite, others exchange peculiar properties; the lower and disintegrated beds become substances of another nature by the addition of alumina, lime, iron, or some other product derived from the overlying beds, the elevated portions of primary matter are intersected by beds of recent deposits, and the rents and fissures produced by the action of heat or running waters are again blocked up.

The material from which granite is produced is variously accumulated; its vast perpendicular face and uninterrupted duration demonstrates an origin, gradual and progressive, within the waters, and firmly fixed in its position during the whole period of its accumulation: it often assumes the conical form, and appears